SYNTAX ZX80®

A PUBLICATION OF **THE HARVARD GROUP**

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IN THIS ISSUE

Remember to return your white renewal card to get a free SYNTAX binder!

MICROACE 8K ROM REPLACEMENTS FROM SINCLAIR

If you bought MicroAce's defective 8K ROM, send it to Sinclair Research with $10. They'll send back a good 8K ROM. Sinclair Research, 50 Staniford St, Boston, MA, 02114.

MICROACE OUT OF BUSINESS IN US

"MicroAce will cease trading in the US" in December, Kevin Hawkins of MicroAce just announced. No legal action forces the withdrawal, he said. MicroAce cannot compete with Sinclair's ZX81. CompShop, the parent company, continues to do business in the UK.

MicroAce customers needing repairs should send their kits to Bob Ward, 3176 Oak Knoll, Los Alamitos, CA, 90720. The costs are the same--$25 for computer repairs, $15 for video upgrade kit repairs.

If you have grievances against MicroAce, write to them in England: MicroAce-CompShop, 14 Station Road, New Barnet, Hertsfordshire, England, EN5 1QW. Kevin said they will handle any customer complaints but cannot answer technical questions. They have received 8K ROMs from Sinclair to fill all backorders. Anyone interested in distributing the video upgrade kit in the US should contact MicroAce at their English address.

NEW ZX81 HARDARE/SOFTWARE VENDOR

Mindware Co. will introduce Barscan for ZX81s in the next few weeks. Barscan uses bar code technology to process collected data on attendance and job costs and can produce standardized printed reports. It provides 16K RAM and self-prompting programs for non-technical users.

Mindware will also distribute others' ZX81 hardware and software and will commission specific hardware and business application packages. Mindware, 70 Boston Post Rd, Wayland, MA, 01778, 617/358-7175.

SYNTAX ERRORS

SABRE's address is 1718, not 1719, Autrey (Nov.81).

Lance Ward's 8K Slalom program (Dec.81) contained 1 error. The last line of line 30 should read:

```
7,22;A$;AT 20,17;A$
```

This adds the last pair of gates. New Syntactic Sum: 20065, 8K Lance also added that for the ZX81, you can delete lines 130 and 140. Insert a FOR-NEXT loop or a PAUSE, varying the length to change the speed of descent.

CLARIFICATION OF BYTES REMAINING

Ian Logan's 8K Bytes Remaining program, Dec.81, uses function keywords for all input except E, the numbers, and the punctuation. Thus after 1 REM type the letter E, the numeral 0, the function RND, the function LN, the function arcosine, a colon, and so on. The only space you type in is 1 after the = sign. The second is put in automatically before the GOSUB.

TRAVEL PACKAGE TO LONDON ZX SHOW

Mindware Co. is sponsoring a travel package to the ZX80/81 Micro Fair show in London. Leaving Jan. 28 from Logan airport in Boston and returning Feb.1, the trip costs $439 per person ($489 single occupancy). It includes roundtrip airfare and hotel. For info or reservations, contact Mike Gonnerman at Mindware, 70 Boston Post Rd, Wayland, MA, 01778, 617/358-7175.

8K/16K OWNERS: Zeta Software of Greenville, SC, now offers 8K/16K program cassettes. Their latest catalog lists a flicker-free scifi adventure and statistical math packages, plus 48 4K/1K listings, including READ/DATA. For a free catalog, write Jon Bobst, Zeta Software, P.O. Box 3522, Greenville, SC, 29608-3522.

SPEED UP YOUR PROGRAMS

Most Sinclair users are new to the programming game. Many will use lines like: 350 GO TO 710

In most cases this is fine, especially in a short program. But in a long program with many GO TO statements, the computer takes a long time for each TV display.

Try this: With the Super Monzxer program (Nov.81) (as an example of a long program) in the computer, add these lines:

```
   3 LET A1=1
   4 IF A1<100 THEN LET A1=A1+1
   5 IF A1>=100 THEN STOP
   6 GOTO 4
```

RUN and the computer will stop at line 5 in about 1 second.

Now change lines 3 to 6:

```
   3 GOSUB 6000
   delete line 4
   delete line 6
   5 STOP
6000 LET A1=1
6001 IF A1<100 THEN LET A1=A1+1
6002 IF A1>=100 THEN RETURN
6003 GOTO 6001
```

RUN and the computer stops at line 5 in about 3 seconds.

The difference in run times is because the computer goes to line 1 every time it finds a GO TO statement. It compares that line number with the GO TO number and continues until they match. Then it executes as required.

To speed up execution, move the calls for actions (GOTO, GOSUB) to high line numbers. ZX80/81s can use line numbers up to 9999. The program might then have a REM statement at line 1 and then some GO SUB destinations, depending on how many groups of action statements you moved. Remember to add a RETURN statement for each GO SUB. Then comes the rest of the program. This way, most of the GO TO destinations are near line 1, the first place the computer looks for them.

Mort Butler, BW-SABRE Inc.,
Houston, TX

NEW 8K ROM ROUTINE ADDRESSES

Here are starting addresses for routines in the corrected 8K ROM. All addresses are hex.

Routine	Address	Use
ENDBYT	01FC	Commonly used by SAVE and LOAD
MAIN	0229	Primary display routine
SLOWIT	0292	Used by SLOW
KYBRD	02BB	Scan keyboard(KB)
SAVE	02F6	Write from memory to tape
LOAD	0340	Read from tape to memory
NEW	03C3	
Cursor:		
Down	0454	
Left	0576	
Right	057F	
Up	059F	
RUBOUT	058B	
GETLNM	05B7	Get a line number into DE
EDIT	05C4	Edit current line
NEWLIN	060C	Get another line of input from KB
RUNIT	063E	Used by RUN
ENTER	06E0	Executed when ENTER (NEWLINE) is in input line
LIST	072C	
PRLIN	0745	Print a line of BASIC
DCDKB	07BC	Decode keyboard
PRDIG	07E1	Print digits
SENDCH	07F1	Continued here from RST
COPY	0869	Copy screen to printer
PRINTA	08F5	Print at
PRKW	094B	Print keywords
NEXT	09F2	
CLS	0A2A	
CLRMEM	0A60	Clear memory
PRLNN	0A98	Print line number
LPRINT	0ACB	
PRINT	0ACF	
PRSTR	0B6B	Print a string BC=length DE=start address
PLOT/ UNPLOT	0BAF	
SCROLL	0C0E	
SYNTAX	0CBA	Syntax checker
Class Table	0D16	
Class 3	0D28	Class 3 Evaluator
Class 1	0D3C	
Class 2	0D6B	
Class 4	0D85	
Class 6	0D92	
IF	0DAB	
FOR	0DB9	
NEXT	0E2E	
RAND	0E69	
GOTO	0E81	
POKE	0E92	
RUN	0EAF	
GOSUB	0EB5	
RETURN	0ED8	
INPUT	0EE9	
FAST	0F23	
SLOW	0F2B	
PAUSE	0F32	
LET	1321	
DIM	1409	
CLEAR	149A	

David Ornstein, Newton, MA

BOOK REVIEW

Title: BASIC Computer Programs for Business, Vol.1
By: Charles D. Sternberg
From: Hayden Book Co., 50 Essex, Rochelle Park, NJ 07662
Price: $10.00

While visiting a favorite book store, I discovered a treasure chest of jewels suitable to adorn the ZX80/81. This book offers "over 35 programs covering budgets, depreciation, cash flow, property comparisons, accounts payable, order entry, warehouse locations, inventory turnover analysis, job routing, resource allocation, production scheduling," just to name a few listed on the cover.

Each program is shown as a photo reduction of an actual working program printout, eliminating the usual typos associated with reprinting program listings. Each program contains adequate REM statements identifying operations and specific routines. The extra plus is the finished product printout of each program incorporating sample data and output--like having answers in the back of the book. It is an excellent resource, text and drill book combined. A definite must for those seeking more knowledge and practical use for their ZX80/81 as well as great fun and a good challenge.

You won't be able to immediately type in programs and run them because they are written around a standard format printer--over 32 columns. Also, a few commands appear that the ZX80/81 does not have, such as LSET, FIELD, and READ. Your machine's shortcomings should not inhibit you. The Breakeven Analysis program, below, was taken from pp.68-70 and now fits beautifully in the 8K/16K ZX80/81.

In this program, I deleted printer functions in favor of video display. The STEP function was removed by replacing the FOR loop with an IF-THEN GOTO statement with counter commands. All IF statements are clearly defined but all equalization statements must be prefaced with LET statements. Thus R0=P*Q0 becomes LET R0=P*Q0. Without the luxury of a 64 column printer, I rounded off data to fit. Decimal answers to 4 places were not practical and unnecessary for most uses. You must watch out for a few other minor things, but you'll catch on pretty quickly.

Mel Routt, Clearwater, FL

BREAKEVEN ANALYSIS--8K/16K

This program requires only a single video format for all control data input with an option to erase and re-enter data. This option occurs just before computation, which doesn't begin until you approve data entries.

The computational mode in the book from which I adapted this program (BASIC Computer Programs for Business, Vol.1, reviewed this page) required a STEP function. Although the 8K ROM provides this function, I replaced it with a counter and IF-THEN GOTO loop; note lines 365 and 370.

All underlined items are inverse graphics. Enter the program, then type RUN to start. Enter total fixed costs and variable costs per unit. When you complete the control data input and approve it, the screen goes blank for a while. Be patient. The time varies with the input data.

If you requested a long table, you will require more time and overflow the display area, getting an error 5. Have no fear--just press CONT (continue) and NL each time the screen fills until you reach the end of your table or memory, whichever occurs first.

Try to borrow or buy a copy of the book this program comes from and use their data input. Your results should nearly match theirs.

```
List of Variables: A=profit or loss
F=fixed costs       C=total costs
P=unit price      C0=breakeven costs
Q0=breakeven point/qty
Q1=start qty        R=total revenues
Q2=stop qty     R0=breakeven revenue
 S=table increment (step)
 U=unit cost         V=variable cost
V1=total variable cost

          Mel Routt, Clearwater, FL

   1 REM "PROFLOSS TABLE"
   2 REM BY MEL ROUTT, 10/3/81
   3 REM ADAPTED FROM PG 69
   4 REM "BASIC COMPUTER PROGRAM
S FOR BUSINESS, VOL. 1"
   5 REM BY CHARLES D. STERNBERG
   6 REM COPYRIGHT 1980
   7 REM BY PERMISSION MR MADARA
S
   8 REM HAYDEN BOOK CO.
   9 REM ROCHELLE PARK, NJ 07662
  10 CLS
  15 PRINT
  20 PRINT "PROFIT/LOSS/BREAKEVE
N TABLE"
  25 PRINT
  30 PRINT " ENTER CONTROL DATA:
"
  35 PRINT
  40 PRINT "FIXED COSTS:";TAB 21
;"$";
  45 INPUT F
  50 PRINT F
  55 PRINT
  60 PRINT "VARIABLE COSTS:";TAB
 21;"$";
  65 INPUT V
  70 PRINT V
  75 PRINT
  80 PRINT "UNIT PRICE:";TAB 21;
"$";
  85 INPUT P
  90 PRINT P
  95 PRINT
 100 PRINT "START QTY OF TABLE:"
;TAB 22;
 105 INPUT Q1
 110 PRINT Q1
 115 PRINT
 120 PRINT "STOP QTY OF TABLE:";
TAB 22;
 125 INPUT Q2
 130 PRINT Q2
 135 PRINT
 140 PRINT "INCREMENT TABLE BY:"
;TAB 22;
 145 INPUT S
 150 PRINT S
 155 PRINT
 160 PRINT
 165 PRINT "IF DATA CORRECTION R
EQ/D TYPE   ""YES"" AND ""N/L"".
"
 170 PRINT
 175 PRINT "IF DATA OK PRESS ""N
/L""."
 180 INPUT D$
 185 IF D$="YES" THEN GOTO 10
 190 CLS
 195 PRINT " PROFIT/LOSS(-)/BREA
KEVEN TABLE:"
 200 PRINT
 205 PRINT "RUN";TAB 7;"JOB";TAB
 15;"REV.";TAB 22;"PROF";TAB 27;
"UNIT"
 210 PRINT "QTY";TAB 7;"COST";TA
B 22;"LOSS";TAB 27;"COST"
 215 FOR I=1 TO 32
 220 PRINT "=";
 225 NEXT I
 230 LET Q0=F/(P-V)
 235 LET X=Q0
 240 GOSUB 700
 245 LET Q0=X
 250 LET R0=P*Q0
 255 LET X=R0
 260 GOSUB 700
 265 LET R0=X
 270 LET Q=Q1
 275 LET C0=F+(V*Q0)
 280 LET X=C0
 285 GOSUB 700
 290 LET C0=X
 295 LET V1=V*Q
 300 LET R=P*Q
 305 LET C=F+(V*Q)
 310 LET U=C/Q
 315 LET X=U
 320 GOSUB 700
 325 LET U=X
 330 LET A=R-C
 335 IF Q<Q0 THEN GOTO 360
 340 GOSUB 600
 345 PRINT Q0;TAB 7;C0;TAB 15;R0
;TAB 23;"BREAKEVEN"
 350 GOSUB 600
 355 LET Q0=999999999999
 360 PRINT Q;TAB 7;C;TAB 15;R;TA
```

```
B 22;A;TAB 27;U
 365 LET Q=Q+S
 370 IF Q<Q2+S THEN GOTO 295
 375 PRINT
 380 PRINT "TOTAL VARIABLE COSTS
: $";V1
 385 PRINT
 390 PRINT "IF YOU WISH TO RUN N
EW DATA     TYPE ""YES"" AND ""N
/L""."
 395 PRINT
 400 PRINT "IF NOT PRESS ""N/L""
."
 405 INPUT D$
 410 IF D$="YES" THEN GOTO 10
 415 PRINT
 420 PRINT "IT WAS A PLEASURE TO
SERVE YOU."
 425 STOP
 600 FOR I=1 TO 32
 605 PRINT "-";
 610 NEXT I
 615 RETURN
 700 LET X=(INT (100*(X+.005)))/
100
 705 RETURN
Syntactic Sum: 45638, 8K
```


PROGRAMMABLE MOVING DISPLAY

Price:	£4.95 (about $10)
ROM/RAM reqd:	4K/1-16K
Printed listings?	Yes
Programs listable?	Yes
Screen prompts?	Yes
Easy to load?	Yes
Display:	Excellent

From: JRS Software, 19, Wayside Ave., Worthing, England, BN13 3JU

At last you can know the secret of true flicker-free continuous display through software! If you're a 4K ROM user envying the ZX81's continuous display, envy no more. For about $10 you can code a rock-steady, moving display into your 4K ZX80.

You get an 8-page instruction booklet, a cassette tape with sample programs, blank and demo coding sheets, and graph paper. The booklet contains directions for running the demo programs, writing your own moving display routines, and gives directions for RAMs over 1K. A complete, step-by-step example accompanies the detailed instructions. With no independent thought, I ran through their example and it worked perfectly.

The cassette holds only one copy of each program, so you should immediately make backup copies on your own recorder. The programs are recorded with a voice leader and load easily.

This routine works very well, but be forewarned that it is not a couple lines of BASIC that you plug into your own programs. Planning the display requires forethought and careful plotting on the supplied graph paper. Then you must type in numbers corresponding to calculated locations and character codes. But JRS's input program and written directions make this task as simple as possible.

The quality of both the display and the documentation impressed me.--AZ

IMPROMPTU SURVEY

Tell a book publisher what you want to know about your computer. Chris Varley, editor, invites you to tell him directly what kind of books you need. Chris Varley, Brady Co., 1610 Worcester Rd., 239A, Framingham, MA 01701.

BINARY REPRESENTATION

Knowing how to manipulate individual bits in your ZX80 is essential for efficient Machine Code programmming, so knowing what bits and bytes are is essential also.

Mechanically, each address in the ZX80's memory contains 8 bits of information (1 byte): 8 "switches" either "ON" or "OFF". In binary representation, or the number system your computer counts in (see Feb.81 p.10), each switch means 1-ON or 0-OFF with these values:

```
BIT # :  7   6   5   4   3   2   1   0
BYTE  :  0   0   0   0   0   0   0   0 = 0
VALUES:128  64  32  16   8   4   2   1
Ex.   :  0   0   0   1   0   1   0   1 =21
Ex.   :  1   0   1   0   1   0   1   0 =
                                  170 (or -86)
```

In 1 byte (8 bits), you can store a positive number from 0 to 255, or a negative number up to 127 if using the left-most bit (#7) as the "sign" bit: 0=positive and 1=negative. The Z80 uses bit 7 for the sign, so any time you PEEK an adddress holding a negative value, it is displayed in 2's complement. That is why our second example is 170 or -86, and not -42. (More on 2's complement next month, or see any Z80 programming book, like Spracklen's Z80 and 8080 Assembly Language Programming or Zaks' Programming the Z80.--AZ)

You can see that having only 8 bits per address rather limits the numerical value in 1 address. So, the Z80 microprocessor accesses 2 bytes or addresses, one after the other, for numbers greater than 255. This means that, in its simplest form (4K ROM), the ZX80 can store numbers from -32767 to +32767 like this:

BIT	LOW-ORDER VALUE		BIT	HIGH-ORDER VALUE
7	128	x256=	15	(for sign)
6	64	x256=	14	16384
5	32	x256=	13	8192
4	16	x256=	12	4096
3	8	x256=	11	2048
2	4	x256=	10	1024
1	2	x256=	9	512
0	1	x256=	8	256
	255	+		32512

255+32512=32767

This chart may explain why, to get a large value, you must multiply one of 2 PEEKed pair addresses by 256.

Next month: BINARY ADDITION & SUBTRACTION

Jon Bobst, ZETA Software, P.O. Box 3522, Greenville, SC, 29608-3522

NOTES ON THE ZX80 DISPLAY FILE

Brook Mick's letter (Oct.81) recalls our early experience with our ZX80. We tried the exercise in the manual, p.24. In the 15th line, every character typed made another disappear from the screen! The answer appeared in an article by David Tebbit, reprinted in Sync.

This phenomenon is normal to unexpanded ZX80 RAMs, because of display file space limitations. Of the 1024 bytes (1K) of RAM, the ZX80 needs 40 to store system variables. It uses another 25 in the display file just to maintain a blank screen (the Linsac Companion, p.64), leaving 959 bytes for displayed and stored program lines, input and calculated variables, and computed output (display). The more you want displayed, the less RAM available for storage and execution; the more program and variables you want stored the less RAM available for display. The TV screen's size limits also cut down on displayed information.

You ask the 1K ZX80 to rob Peter (display) to pay Paul (storage). To comply, it erases screen characters. When it nears the display file limit, the ZX80 subtracts bytes from the display file to store newly inputted characters (and erase ones on the screen). Already displayed characters disappear from the display file, but not from storage. RUBOUT removes the latest entries from storage, freeing bytes for the display file and lost characters reappear.

A similar thing occurs with a 16K RAM pack, but with worse consequences. Total RAM is 16384 (16 x 1024). Subtracting 40 bytes for system variables and 25 for display file leaves you 16310 bytes. The ZX80 expands its storage capacity, but not its display file capacity.

The TV screen gives 24 lines of 32 characters, including spaces, or 768 total "squares." Since most keywords and characters occupy 1 byte, assume the screen holds 768 bytes. Input (program lines and prompt responses) uses far less of this maximum potential than does output. ZX80s permit only 14 full 32-character lines, plus a 15th line of about 10 (prompt response) to 18 (program characters) spaces for keyboard input. This gives you a maximum of 458 to 466 1-byte characters, including spaces.

If you pass this limit, the ZX80 makes room in the display file for more input by sacrificing its supplied cursors and the end quote in string prompt responses. It next removes bytes from the display file, causing screen erasure. For output of computed information, the ZX80 only needs the last screen line to print a run report, or error code. So an output display can fill 23 lines of 32 characters each (736 in all) and RUN successfully. If you ask for 737 characters, the program stops, giving error 5 (no more room on screen) having printed up to 736 1-byte characters, its maximum output at any time. On a 1K machine, the more program and stored variables, the less room in the display file.

A 16K RAM can also output 736 bytes at a time in a successful run, then stops with error 5. Until the program and all variables exceed 15583 bytes, the ZX80 won't cut down this maximum display.

Input data also permits this maximum, but cursors and end quotes for strings (needed for acceptable input) use 2-3 of the total 736 screen spaces. To allow for the letter cursor, syntax marker in program input, and mandatory or supplied end quote, keep maximum input display in 1 program line or prompt response to 733 bytes or fewer. If you don't, you won't get an easily cured disappearing act as on the 1K machine. Instead, you'll face an impasse with your ZX80 and have to pull the plug!

Sage Kring, Brookfield, MA

MORE HARDWARE HINTS

Poor Contact

Polish the board edge contacts for the RAM almost to bare copper. Otherwise grit gets in the solder and causes intermittent contact. Coat with high detergent motor oil (Mobil No. 1, for example.); it is designed to prevent oxidation of copper, lead and tin in engines.

Put a pad between the RAM and the computer to prevent rocking. Fasten both to a board to prevent relative motion.

Some of the cable plugs go in too far for a reliable contact. Press a no. 4 split lock washer down to the base of such plugs for correct insertion depth.

Improve the contact between the grounding fingers and the case by placing foil strips in the case. This helps contact the metalized surface of the plastic. Tape the foil in by the ends.

Some computers and RAMs are inadequately masked and metallized where shorts may occur. Tape insulates some areas, but it cuts through. If you scrape the metal from the plastic near the sides or keyboard where shorts might occur, you will permanently cure the shorting problem. Remove only enough metallizing to prevent shorts; otherwise you will create an interference problem.

Heat

Cut ventilating holes or slots in the computer and RAM, then cover the openings with flyscreen to let heat out and keep junk out.

Operation

Keep your TV away from the tape recorder; some pick up the 15 KHz from the TV and feed it to the computer. (It won't load this noise!)

Record valuable tapes on more than one cassette; store them separately. These precautions minimize damage if you mess up the work tape.

Tape Care

Label cassettes with typewriter correction tape stuck on the back. Store open end down so you can see labels on more tapes and dust falls out, not in.

Keep cassettes in plastic baby bottle bags. They are better than tape boxes at keeping out the worst problem--dust and dirt. Secure with an elastic around the long way of the cassette.

Store tapes edge down in 3x5 metal card file boxes, 5 to a box. This also protects against weak magnetic fields.

Tape Loading

Figure one shows an improved loading filter. This works even better than the one in SYNTAX (p.11 Sept.81).

Static Control

Static may cause a crash if you shuffle your feet on a rug before touching the computer. Ground yourself and the computer if necessary. On upgraded (8K) ZX80s, put foil under the overlay and ground the foil. Expose an edge of foil to ground yourself.

Brian O'Brien, 15 Country Drive, Weston, MA, 02193, 617/891-8990.

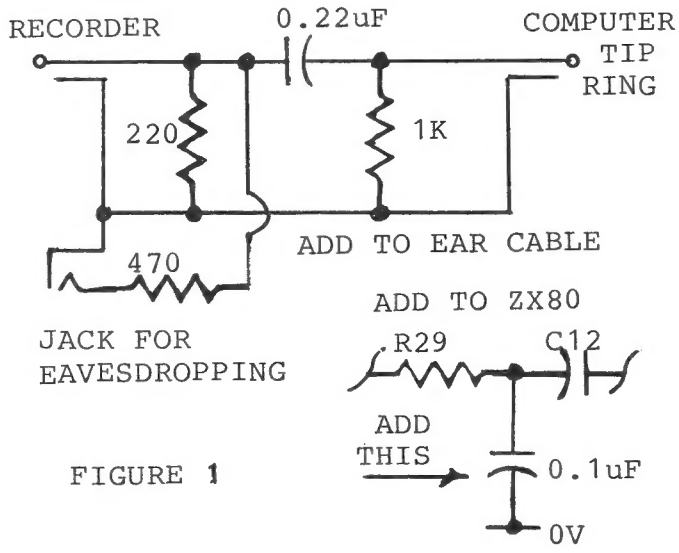
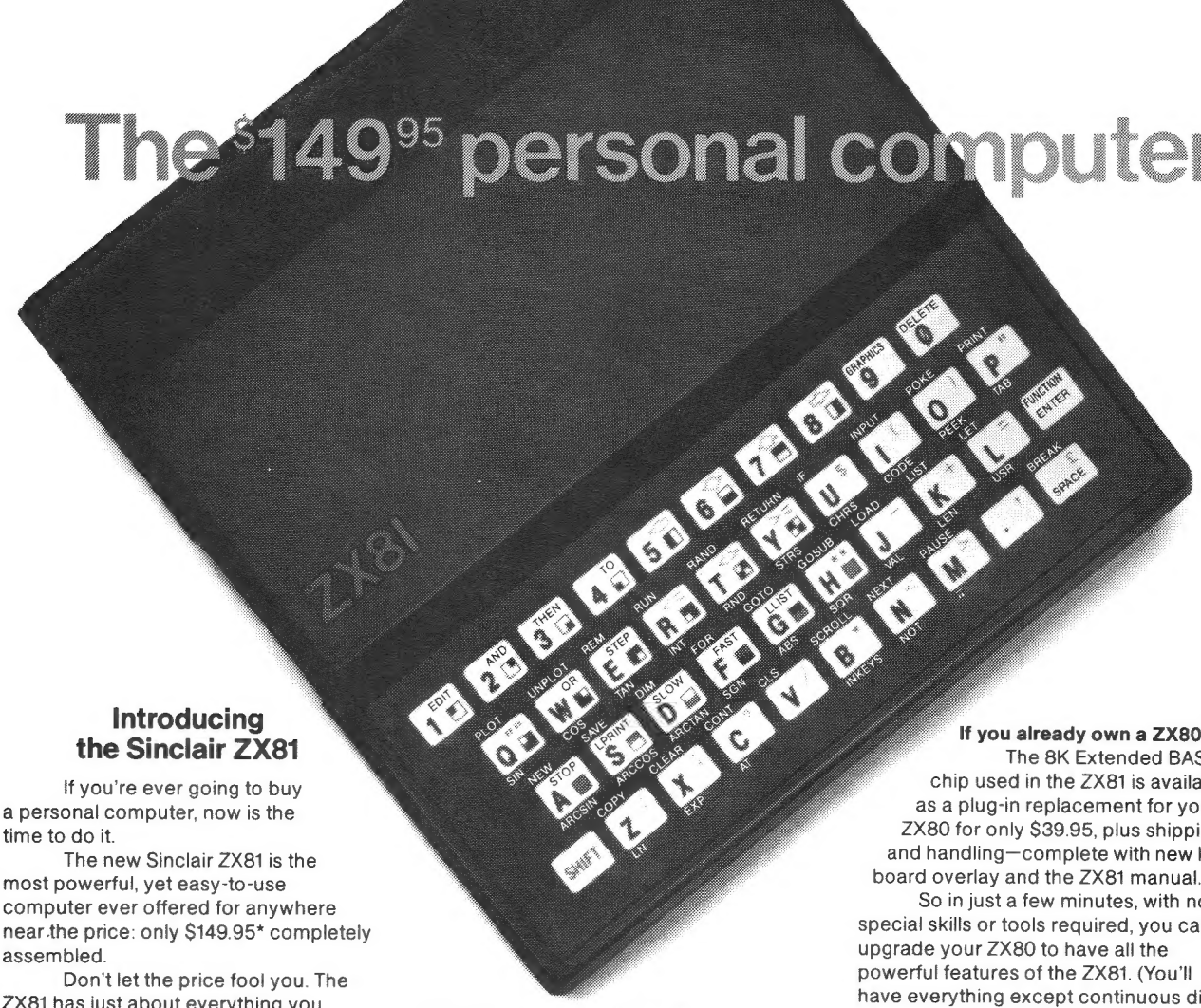


FIGURE 1

The $149.95 personal computer.



Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

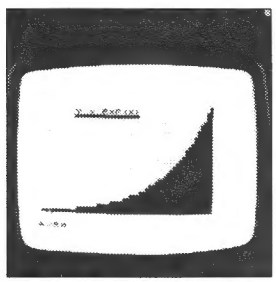
With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

Order at no risk**

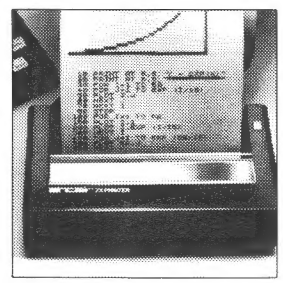
We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

**Does not apply to ZX81 kits.

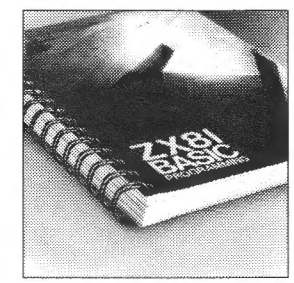


NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.

16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.



ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

The $99.95 personal computer.

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $99.95*. It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

How to order

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DEAR EDITOR:

I ordered MicroAce's 8K ROM and Flicker-Free Video Upgrade board. When they arrived I easily changed ROMs and the 8K worked fine. The instructions for the upgrade kit were minimal, to say the least, but they did contain John Strain's mod (Sep.81).

When I soldered the capacitors, I left enough leads so they could be bent down close to the board (knowing that space would be tight). Then I attached John's mod right on the edge of the FF board, using the resistor and transistor leads for support. I clipped off all the IC and socket prongs from both the ZX80 and the FF board on the solder side. This allowed the 2 boards to get close together, saving space.

I put a piece of 5 mil acetate plastic on the ZX80 board to insulate it from the FF board bottom and taped them together. Finally, I put another piece of acetate on the ZX80 case where the FF board might touch. The case went together fine, not even a bulge. The FF upgrade works fine. It even works the FAST and SLOW BASIC commands, like the ZX81, with no problems whatsoever.

A Silver Springs, MD, Reader

My new ZX81 is inconsistent with regard to "glitches." Sometimes I get 1 per minute, othertimes none for an hour. The AC adapter measures 13.75 Vdc, not 9.75 Vdc. Should I return it to the factory?

Bill Hulett, Jackson, MS

Skip Hammel of Sinclair says your glitch problems probably result from your home wiring. Appliances can cause power drops, as when a refrigerator kicks on. Try a line filter (available cheap from Radio Shack) to prevent these problems. The voltage you measured is OK for an unloaded line. When in use, the voltage drops to around 9 V.--AZ

I had a problem with my 16K RAM pack dumping programs on my ZX80. The slightest movement of the RAM pack caused it to dump. I took the eraser from a pencil and gently rolled it down between the computer and the RAM pack about 1/4", just enough so the RAM pack fits snugly on the computer. The RAM doesn't lift up when pushed. I've had no problems with dumping.

Jim O'Toole, Ridge, NY

Vol.2 No.11 mentions upgrading a ZX81 to 2K RAM by replacing one chip. One article says to use a #6116 (Hitachi); the other says to use a #4816 and one jumper. How do I obtain info on which is which and how to do it? Also, can I use a larger keyboard? What kind?

Howard Kaplan, Van Nuys, CA

To get chip information, contact the manufacturer's local rep or the company itself. See classified ads this issue for a 6116 source. People we've talked to do better with the 6116 chip. To install either, remove the RAM chip(s) on the right of the ZX81 board. (If you got an assembled one, pry the feet off and remove the screws underneath to open the case.) If you have only one RAM chip, it's in a socket with 4 spare pins. Remove this chip and plug in the 6116 or 4816. Remove the jumper marked L1 on the right of the socket and make the connection marked L2 (printed on the board, or see a schematic). If you have two RAM chips, remove them both and install a 28-pin socket where the rightmost chip was, then make the new connection and plug in the new chip.

You can attach a larger keyboard to your ZX81. Commercial keyboards, kits and plans are

available from LJH Enterprises and A.P. Electronics, both in California (see ads this issue.) You can also build one yourself using surplus materials. Check our how-to articles in Dec.80 and Mar.81.--AZ

My SABRE 4K memory board came with clear assembly instructions and drawings showing where to put the diodes and jumpers. My only trouble was not telling them I intended to use the board with a 2K MicroAce. When I wrote them about my problem, Mr. Sisco called to tell me that their board bats heads with the 2K MicroAce. They sent me a modification kit, but I just pulled the RAM out of the MicroAce and got 4K with the board. You'll come out money ahead by buying the complete kit from SABRE at $45. You don't save much looking for the parts. The cheapest I found the 6116 was $15.95.

LaVerne Hoffman, Canby, OR

ATTENTION USERS' GROUPS

Many readers call or write to ask about users' groups in their areas. Specifically, people in Seattle, Austin, Philadelphia and Chicago are looking for groups to join. Please send us a notice of your existence and we'll send interested ZX80/81 users to you.

BALTIMORE AREA USERS' GROUP: Jack Fogarty is coordinator of the Westinghouse Sinclair Users' Group. Most members are in Westinghouse, but Jack says any area user is welcome. Contact him at Westinghouse, Advanced Technology Labs, MS 3525, Box 1521, Baltimore, MD, 21203, 765-7118.
NEW OKLAHOMA USERS' GROUP: Patrick Spera plans to form a users' group in the Midwest City, Del City and Tinker AFB (OK) area. Interested users should contact Sgt. Patrick Spera, T-148, Tinker AFB, OK, 73145, 732-3848.

EQUATIONAL AND/OR--8K, 4K

Many users are confused about the logical use of AND and OR in the 8K ROM. Here is a touchstone (demonstration) program illustrating various uses of AND and OR.

```
  10 LET A=1
  20 LET B=2
  30 LET C=3
  40 LET D=4
  50 LET E=5
  60 IF E=5 AND D=4 AND C=3 THEN
 PRINT "THE PEACH ";
  70 IF E=4 OR E=5 THEN PRINT "B
LOSSOMS ";
  80 IF (D=5 AND E=4) OR (D=4 AN
D E=5) THEN PRINT "SMELL ";
  90 IF (D=4 OR D=5) AND (A=2 OR
 A=1) THEN PRINT "GOOD ";
  99 IF B=1 OR B=3 OR B=2 THEN P
RINT "TODAY."
```

Does the whole sentence print? Run the program to find out.

Note that here we are only describing the use of AND/OR separating equations (like X=Y AND Z=A), not the use of AND/OR without equations (like X AND Y). We will tackle the latter use at another time to better separate the two broad uses in your mind.

We recently used this line in a program and it worked:

```
 764 IF M$(C,1)=M$(C,5) AND M$(C
,2)=M$(C,6) AND M$(C,1)=M$(H,1)
AND M$(C,5)=M$(H,5) AND M$(C,2)=
M$(H,2) AND M$(C,6)=M$(H,6) AND
((M$(C,3)<>M$(H,3) AND M$(C,7)<>
M$(H,7)) OR (M$(C,4)<>M$(H,4) AN
D M$(C,8)<>M$(H,8))) THEN LET E(
1)=E(1)+1
```

You can use the touchstone program to guide you in contructing such complex lines.

Paul Ezra, San Diego, CA

Note that if A is true and B is false, A AND B is false, but A OR B is true. In an IF-THEN statement, true results tell the computer to execute the command after THEN. False results cause the computer to skip the command after THEN.--AZ

HARDWARE REVIEW

CAI Instrument's Widget Board
Price: $79.95
CAI Instruments, 2559 Arbutus Ct., Midland, MI, 48640, 517/835-6145

Most of us are pretty tired of waiting up to a year for delivery and then getting equipment and manuals with obvious mistakes. Couple that with an unresponsive manufacturer and you get frustrated customers. Because of problems detailed below, SYNTAX recommends that you delay purchasing the Widget until CAI Instruments offers correct, complete, and consistent documentation and prompt shipping schedules. If you can deal with these problems yourself, the Widget provides you with a packaged set of ports and peripheral controllers.

You pay more for the Widget without printer and tape control EPROMS--$80 for the Widget alone, only $60 with printer and tape drive. ROMs come with the peripheral, not with the Widget.

The Widget plugs into the ZX80/81 expansion port. The 16K RAM plugs into a similar port at the rear of the Widget. At the left of the Widget housing you see three connectors--two IC sockets to connect CAI's printer and continuous tape drive plus a 20-pin male connector for parallel and serial port outputs.

You MUST add RAM to use the Widget, and all 16K machines we tried appeared to have only 2K remaining with our Widget attached. CAI Instruments say that they use the upper 4K of memory, leaving 12K free with a 16K RAM. We are unable to verify that.

CAI's device produces RS-232C compatible serial output. That means the electrical signals provide well-defined voltages and signal timing. It does NOT mean that all RS-232 control functions or ASCII translations are provided. Nor do you get a standard RS-232 connector.

We judge the pinout, diagrammed below, to sensibly segregate the serial and parallel ports as well as the parallel input and output. To use ribbon cable, you'll have to unscramble things at your end.

```
RCV     D4 D2 D0 D6 D3 D5 D2 D1
 o  o  o  o  o  o  o  o  o  o
SER 0V INPUT  DATA OUTPUT DATA
 o  o  o  o  o  o  o  o  o  o
XMT     D7 D3 D1 D5 D4 D0 D7 D6
```

The bare-bones Widget gives you a fully-buffered expansion port, but no hint of how many loads you can drive. You also get two 8-bit, parallel ports, one input and one output. Third, you get serial I/O with RS-232 signal levels at one, jumper-selected, Baud rate of 300, 1200, 2400, 4800, or 9600.

In my judgement, Widget construction techniques may induce failures and make maintenance tough. Inside, 39 separate pins connect the 2 stacked boards electrically and mechanically--a maintenance nightmare.

Half the ICs are sandwiched between these boards, a problem for both cooling and maintenance. Our sample contains 4 unrestrained long wire jumpers (1 soldered directly to IC pins at the device bodies) --expect trouble here from vibration. When attached, the Sinclair RAM hangs unsupported on its connector.

The instruction manual contains inconsistencies in POKE or PEEK addresses and programs that will not run. Modifications listed for the 8K ROM are correct, but not complete. Devise your own scheme to check the status bit on 8K machines because CAI's example ignores 4K/8K ROM differences. CAI provides a schematic with the Widget and hardware buffs could fill in the omissions. Computer and I/O busses are shown in single-line form with complete pin connections.

We found no pinouts for peripheral sockets. Nine ICs carry no type markings on the schematic. Logic circuitry is shown in functional form, but you cannot tell which functions are in which package. CAI provides no IC list.

According to Bob Swann of CAI, we got the wrong page for table B, so we got no pinout diagrams for the connectors. Bob provided the pin numbers (not marked on the Widget) by phone and promised to have someone call us about the program problems. We'll let you know when they do so.

Despite these problems, we successfully operated the device. We ran serial echo checks. We also tested the parallel input and output ports. All operations seem correct; we found no bugs other than the unresolved memory issue. In my judgement, the device works with ZX80/81s. We made no tests with MicroAces.--KO

BAR CHART--8K/2K

Bar Chart uses the 8K PLOT function to simplify the bar chart algorithm. It assumes B(15) has been filled, or partially filled, with values between 0 and 2000.

Lines 20-50 provide scale marks and label 3 of them in 1000s. Line 60 should be 1 TO (size you dimension B to). Line 80 will STOP at the first unfilled element of B. All elements are initially set to 0 with the new ROM. Line 90 sets the range--100 per pixel in this case--and makes the half-range adjustment (-50) so each pixel represents a midpoint (eg. pixel 100 represents values from 50-149). Line 100 spaces between each bar (A*2) and tabs over to allow for the scale (+3). Line 130 means that to enter a new value, simply enter LET B(A)= (new value), press NL, then GOTO 1. Do not type RUN again.

Set line 90 for the desired pixel range, adjust line 100 to make more room for your scale, if needed, and experiment with various scale representations. I kept mine simple to save memory. DIM(B) can be larger or smaller than 15.

Jon Passler, Beverly, MA

```
  1 DIM B(15)
  2 FOR X=1 TO 15
  3 INPUT B(X)
  4 NEXT X
 10 REM BAR CHART (0-2000)
 20 FOR A=11 TO 21
 30 PRINT AT A,1;"-"
 40 NEXT A
 50 PRINT AT 11,0;"2";AT 16,0;"
1";AT 21,0;"0"
 60 FOR A=1 TO 15
 70 FOR P=1 TO 43
 80 IF B(A)=0 THEN STOP
 90 IF B(A)<P*100-50 THEN GOTO
120
100 PLOT A*2+3,P
110 NEXT P
120 NEXT A
130 REM INPUT B(A)
Syntactic Sum:  19586, 8K
```

4K/1K BLACKJACK

In this 4K/1K ZX80 version of 21 you play one-on-one against the computer-dealer. It deals you two cards face up. To take another card, hit NL; to hold, press SPACE NL. The ZX80 then plays out its hand and shows if you win or lose.

You can only play 5 cards, and you cannot convert aces from 11s to 1s. The computer masks its down card and score until it plays. To play again, hit NL; to exit, hit SPACE NL. Line functions appear after semicolons in each line.

Wayne Root, Garfield Heights, OH

```
 10 DIM P(5)  ;your hand
 20 DIM C(5)  ;computer's hand
 30 DIM D(10) ;deck of cards
 40 LET Q=0   ;position of card
              ;in your hand
 50 LET U=0   ;position of card
              ;in computer's hand
 60 LET V=1   ;ZX80's turn? 0=yes
 70 FOR J=3 TO 5
 80 LET C(J)=0 ;clears cards 3,4,5
 90 LET P(J)=0 ;of last hand
100 NEXT J
110 GO SUB 360 ;shuffle
120 GO SUB 500 ;deal your card 1
130 GO SUB 550 ;deal ZX80's card 1
140 GO SUB 500 ;deal your card 2
150 GO SUB 550 ;deal ZX80's card 2
160 GO TO 200
170 INPUT A$   ;want a card?
180 IF NOT A$="" THEN GO TO 230
      ;yes hit NL, no hit space NL
190 GO SUB 500 ;deal you a card
200 IF S>21 THEN GO TO 300 ;lose?
210 IF S=21 THEN GO TO 230 ;if 21
      ;then ZX80's turn
220 GO TO 170
230 LET V=0    ;now ZX80's turn
240 GO SUB 600 ;show hidden card
250 GO TO 270
260 GO SUB 550 ;deal ZX80's card
270 IF T<17 THEN GO TO 260 ;ZX80's
      ;total <17?
280 IF T>21 THEN GO TO 340 ;ZX80
290 IF T<S THEN GO TO 340  ;loses?
300 PRINT "LOSE"
310 INPUT A$   ;play again?
320 IF NOT A$="" THEN STOP
330 GO TO 40   ;restart
340 PRINT "WIN"
350 GO TO 310
360 FOR J=1 TO 10 ;shuffle routine
370 LET X=RND(52) ;random card
      ;choice
380 FOR W=1 TO 10
390 IF X=D(W) THEN GO TO 370 ;that
400 NEXT W   ;card already picked?
410 GO TO 430
420 LET X=X-13 ;card point value
430 IF X>13 THEN GO TO 420
440 IF X>10 THEN LET X=10 ;face
      ;cards=10
450 IF X=1 THEN LET X=11 ;aces=11
460 LET D(J)=X ;place card in deck
470 NEXT J
480 LET K=0 ;card position in deck
490 RETURN
500 LET K=K+1   ;next position
510 LET Q=Q+1 ;next position in
              ;your hand
520 LET P(Q)=D(K) ;from deck to
              ;your hand
530 GO SUB 600  ;print
540 RETURN
550 LET K=K+1 ;next deck position
560 LET U=U+1 ;next position in
              ;ZX80's hand
570 LET C(U)=D(K) ;from deck to
              ;ZX80's hand
580 GO SUB 600  ;print
590 RETURN
600 CLS    ;print subroutine
610 LET S=0 ;clear your total
620 LET T=0 ;clear ZX80's total
630 FOR Z=1 TO 5
640 IF V=Z THEN GO TO 670 ;if not
      ;ZX80's turn, mask card 1
650 PRINT P(Z),C(Z) ;print cards
660 GO TO 680
670 PRINT P(Z),C(Z) ;masked card 1
680 PRINT
690 LET S=S+P(Z) ;add your score
700 LET T=T+C(Z) ;add ZX80's score
710 NEXT Z
720 IF V=1 THEN GO TO 750 ;not
      ;ZX80's turn yet
730 PRINT S,T  ;print totals
740 GO TO 760
750 PRINT S,CHR$(15) ;mask ZX80's
760 PRINT          ;score
770 RETURN
```

Syntactic Sum: 8075, 4K

ADDRESS AND PHONE BOOK--4K

This 4K program stores ASCII as codes into an array, getting around the 4K BASIC's lack of string arrays. It stores and prints names and addresses one at a time. This program runs in a 2K machine; for 1K RAM reduce DIM A.

Type in the program, then RUN. Answer A to the first prompt, then enter the requested information. When you list names, enter A in response to the LS prompt to see the next name. SAVE, then reLOAD. Type GO TO 20, not RUN, to see saved names and addresses.

John Walsh, Van Nuys, CA

(I got about 5 names and addresses in with A dimensioned to 250, using a 16K RAM pack.--AZ)

```
  5 DIM A(250)
  6 LET N=0
 10 CLS
 20 PRINT "ENTER A TO ADD.  DEF
AULT IS LIST."
 30 INPUT A$
 40 IF A$="A" THEN GO TO 300
 50 CLS
 60 LET X=0
 70 IF A(X)=222 THEN GO TO 130
 80 IF A(X)=130 THEN GO TO 170
 90 PRINT CHR$(A(X));
100 LET X=X+1
110 IF X=N-1 THEN STOP
120 GO TO 70
130 PRINT
140 PRINT
150 LET X=X+1
160 GO TO 70
170 INPUT A
180 LET X=X+1
190 CLS
200 GO TO 70
300 CLS
310 PRINT "NAME ?"
320 GO SUB 500
330 PRINT "STREET ?"
340 GO SUB 500
350 PRINT "CITY, STATE ?"
360 GO SUB 500
370 PRINT "ZIP ?"
380 GO SUB 500
390 PRINT "PHONE ?"
400 GO SUB 500
410 LET A(N)=130
420 LET N=N+1
430 GO TO 10
500 INPUT N$
510 LET A=CODE(N$)
520 IF A=1 THEN GO TO 570
530 LET A(N)=A
540 LET N=N+1
550 LET N$=TL$(N$)
560 GO TO 510
570 LET A(N)=222
580 LET N=N+1
590 RETURN
```

Syntactic Sum: -24803, 4K

SIMULATE READ, DATA FOR STRINGS

Although your ZX80 (both ROMs) or ZX81 does not have READ, DATA or RESTORE functions, you can easily mimic them with other functions.

Some background: String variables are like numerical vari-

ables, which we've already discussed--they are named by a letter and you assign values to them. Unlike numerical variables, the value you give a string variable is always a string of characters and these characters can be letters or numbers. String variable names always contain one letter and a dollar sign (A$, Q$) and the string itself is in quotation marks.

ZX80/81s always save variable values, whether strings or numbers. Thus, after running a program and entering values, you can save them on tape with the program. To use them again, remember to type GO TO X, where X is a line number after the variable assignment statements. RUN, CLEAR or NEW will erase the values you saved.

To simulate READ, DATA and RESTORE functions (described last month), you can just assign each string to a different string variable. Put the assignment lines at the beginning of your program:

```
10 INPUT A$
20 INPUT B$
```

The strings you enter for A$ and B$ will save with your program. To use them later, type GO TO 30. The program will execute from line 30 on, and not ask you to input A$ and B$ again. It will use the strings you already entered.

A way to more closely simulate READ, DATA and RESTORE is to use subroutines. You assign different values to only one string variable. This method also uses the ZX80/81's ability to GO TO a calculated line number. The 4K program accompanying our telephone dialer project (Feb. 81) is a simple example.

The program stores names and telephone numbers. To put names into the program, you list them in short subroutines at the end (like DATA statements). We'll ignore the phone numbers here. Use D$ as the string variable and put a RETURN after each:

```
700 LET D$="UNCLE JIM"
```

```
 704 RETURN
 710 LET D$="DIR. ASSISTANCE"
 714 RETURN
 720 LET D$="EMERGENCY"
 724 RETURN
```

Notice that each set of line numbers differs only by 10. This lets us call the subroutines easily.

At the front of the program we find:

```
 100 FOR G=1 TO 10
 120 GO SUB 690+G*10
 130 PRINT D$
 140 NEXT G
```

If G=1 then 690+G*10=700, the first subroutine's line number. The computer goes to 700, assigns D$ the string "UNCLE JIM", then returns to the line after the GO SUB (line 130). Now it prints UNCLE JIM and goes to the next line, 140. Line 140, the end of the FOR-NEXT loop, sends it back to line 100. Now G=2, so the GO SUB in line 120 send the computer to 690+2*10, or line 710. Line 710 assigns another string, "DIR. ASSISTANCE", to D$. Line 714 returns the computer to line 130. The cycle continues till all values for D$ have been read.

In this example, the GO SUB within the FOR-NEXT loop acts as a READ statement. The short subroutines assigning values act as DATA statements.

To simulate RESTORE, you need only use a GO TO 100 statement. This sends the computer back to the first "READ" line to start all over. When you save this program, you can type RUN because the values are not stored as variables but as program lines.

These methods work on both ROMs.

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- The Syntactic Sum (using the Syntactic Sum program in the February, 1981, issue).
- Whether it fits in 1K or 2K RAM (or 16K when available).
- Whether it uses the 4K or 8K ROM.

We pay for this explanatory text at the same rate as for articles in addition to payment for the program itself.

If you want us to return your original program listing or article, please include a self-addressed, stamped envelope. Otherwise, we cannot return submitted material.

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